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ABSTRACT

Two methods were used to project college and university enrollment in South Carolina: the age ratio method, which correlates college attendance with the population of traditional college age; and the cohort survival method, using historical data on the progression of students from high school to and through college. The projections indicate that enrollment in senior and junior colleges and universities in the state will continue to increase in the 1976 to 1985 period, but at a substantially lower rate than previously. The two projection methods yield increases of 40 and 26 percent respectively. The difference between the two projections seems less significant than the fact that neither method projects a downturn in degree-credit enrollment in the forseeable future. Some charts and tables are included. (Author/MSE)

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PROJECTED DEGREE-CREDIT ENROLLMENTS THROUGH 1985 IN SOUTH CAROLINA COLLEGES AND UNIVERSITIES

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May, 1977
South Carolina Commission on Higher Education
Columbia, South Carolina

Projected Degree-Credit Enrollments Through 1985 in South Carolina Colleges and Universities

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I. Summary

College and university enrollments in South Carolina, as elsewhere in the United States, increased dramatically in the last decade. There is now a widely-shared conviction that the period of rapid growth is over. Indeed, in some parts of the United States, enrollments in colleges and universities are either stable or are actually decreasing in absolute terms.

The projection of enrollments is far from an exact science. For this reason, two independent projections have been made where the historical data permit. To the extent that two independent methods agree on the trends projected for the future, the confidence that can be placed in either is increased. Although the techniques for the two projections are different, and utilize different sets of data, both rely on the assumption that trends established in the recent past will be continued in the immediate future. Throughout, it has also been assumed that no major economic crises will occur, that the structure of the higher education systems in the State will not change, and that adequate financial support for higher education will be made available.

The first method employed, called the "age ratio" method, is based on the fact that a statistical correlation has existed in the past between college enrollments and the college-age population of the State. This correlation was measured, extrapolated into the future, and combined with a projection of the college-age population to yield projected enrollments. This method was applied separately to enrollments in the senior colleges

and universities, and a modified version was applied to institutions under the aegis of the State Board for Technical and Comprehensive Education.

The second method utilized available data on the progression of students from high school to and through college. It is called the "cohort survival" method. This method could not be applied to the Technical Education Colleges and Centers because historical data applicable to them do not exist.

The results yielded by both methods are summarized in the table below:

Summary of Degree-Credit Enrollment Projections, South Carolina

Year	Actual Headcount Enrollment	Projected Headcount Enrollment, All Institutions "Age Ratio"*	"Cohort Survival"*
1966	46,137		
1975	116,408		
1976	112,516		
1978		126,200	125,300
1980		139,400	134,800
1985		168,500	156,100

*--plus Modified Age Ratio for S.B.T.C.E. institutions.

The projected enrollments through 1985, by major sectors of the institutions, are shown in Figures 1 - 3.

Actual enrollment in senior and junior colleges and universities in the State very nearly doubled--the increase was 96 percent--between 1966 and 1975. These projections indicate that enrollment in these institutions will continue to increase in the 1976 to 1985 period, but at a substantially slower rate. The "age ratio" and "cohort survival" methods yield projected increases of 40 percent and 26 percent, respectively, in this period. Given the uncertainties inherent in such projections, the difference between the two is less significant than the fact that neither method projects a downturn in degree-credit enrollment in the foreseeable future. The important conclusion is that

both techniques indicate the probability of increasing enrollments, although at a much slower rate than in the recent past.

Projections of degree-credit enrollment in the public Technical Education Centers and Colleges are on less firm statistical grounds, primarily because of the comparative youth of this system. The estimates of future growth were made by assuming that the ratio of enrollment to population in that system would approach by 1984 that now projected for the U. S. as a whole. The result indicates an increase from 1976 to 1985 of 92 percent.

These projections for South Carolina are at variance with national trends currently foreseen by many authorities. For example, the U. S. Office of Education, using techniques identical to those used here, has estimated that total higher education enrollment in the United States will increase by 1981 by about 10 percent over the 1975 level, followed by a downturn resulting in a total 1984 enrollment about 5 percent larger than that prevailing in 1975.

The projected results in South Carolina are different because it is assumed that:

(1) the projected population of college age in South Carolina will continue to increase throughout most of the next decade, primarily because of a continuing net in-migration, and

(2) the projected numbers of high school graduates will continue to increase throughout most of the next decade, in spite of a downturn in the elementary school population which has already begun, because of immigration and a projected lower attrition rate in the public school system.

The staff of the Southern Regional Education Board has projected

total enrollments (degree-credit and non-degree-credit) for the region as well as for each of the 14 states within the region. The projection is that total enrollment in South Carolina will increase by 5% in 1980 over the 1975 figure, but will decrease by 10% in 1985 compared to 1980. This projection utilized an age-cohort method, similar but not identical to Projection A as described above, but utilized a different projection of the college-age population than that employed in this study. The population projection utilized by the SREB for South Carolina included a forecast that the rate of net in-migration of people to the State would decrease in the last half of this decade, and that net out-migration would begin again in the 1980's.

Descriptions of the methodologies used in arriving at the projections made here, with accompanying tables of figures, follow in Section II. Some technical notes on the methodologies are given in the Appendix.

Figure 1

Actual and Projected Enrollments,
S. C. Colleges and Universities,
1973 - 1985

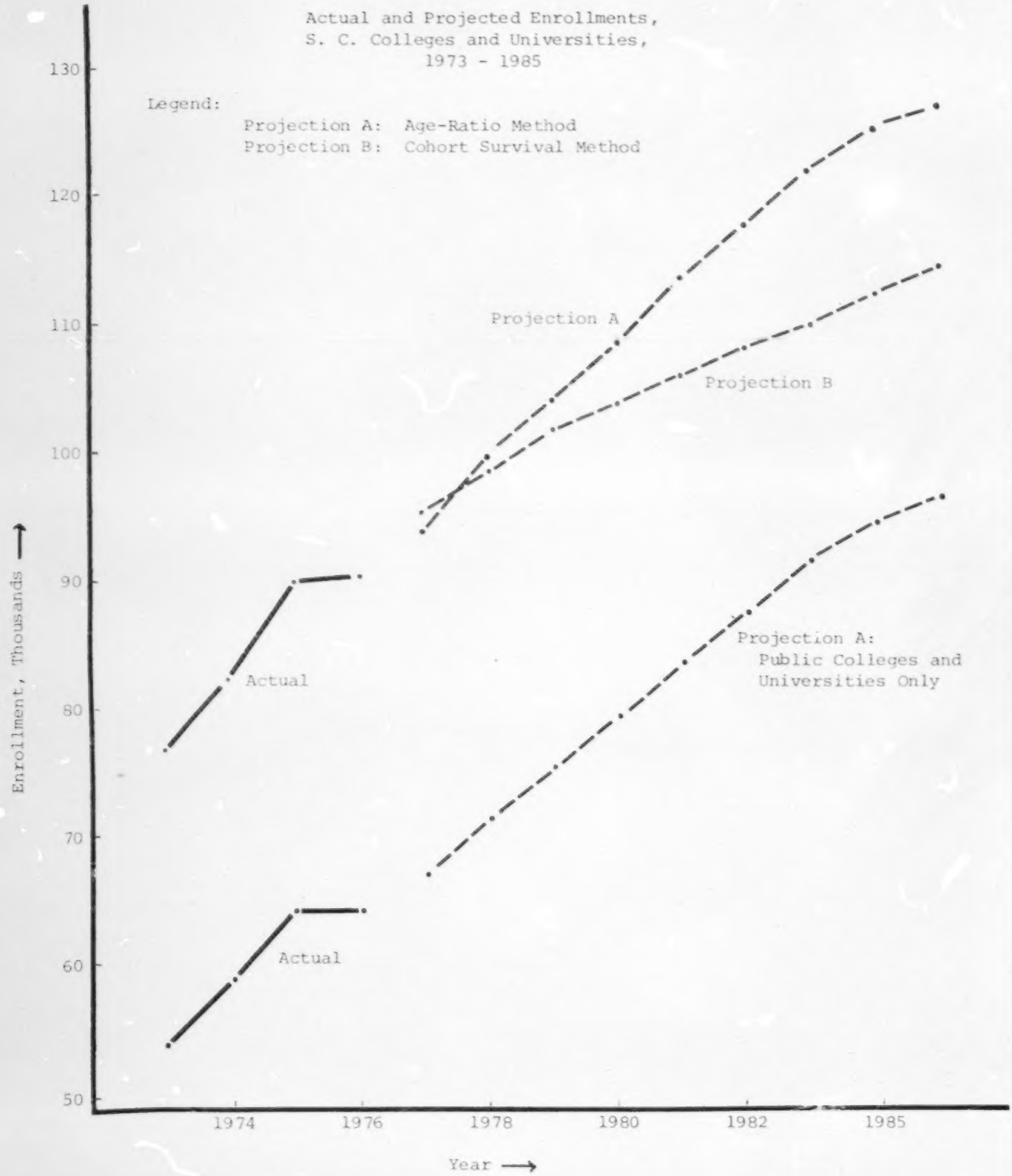


Figure 2

Actual and Projected Degree-Credit Enrollments,
S. C. Technical Education Centers and Colleges,
1973 - 1985

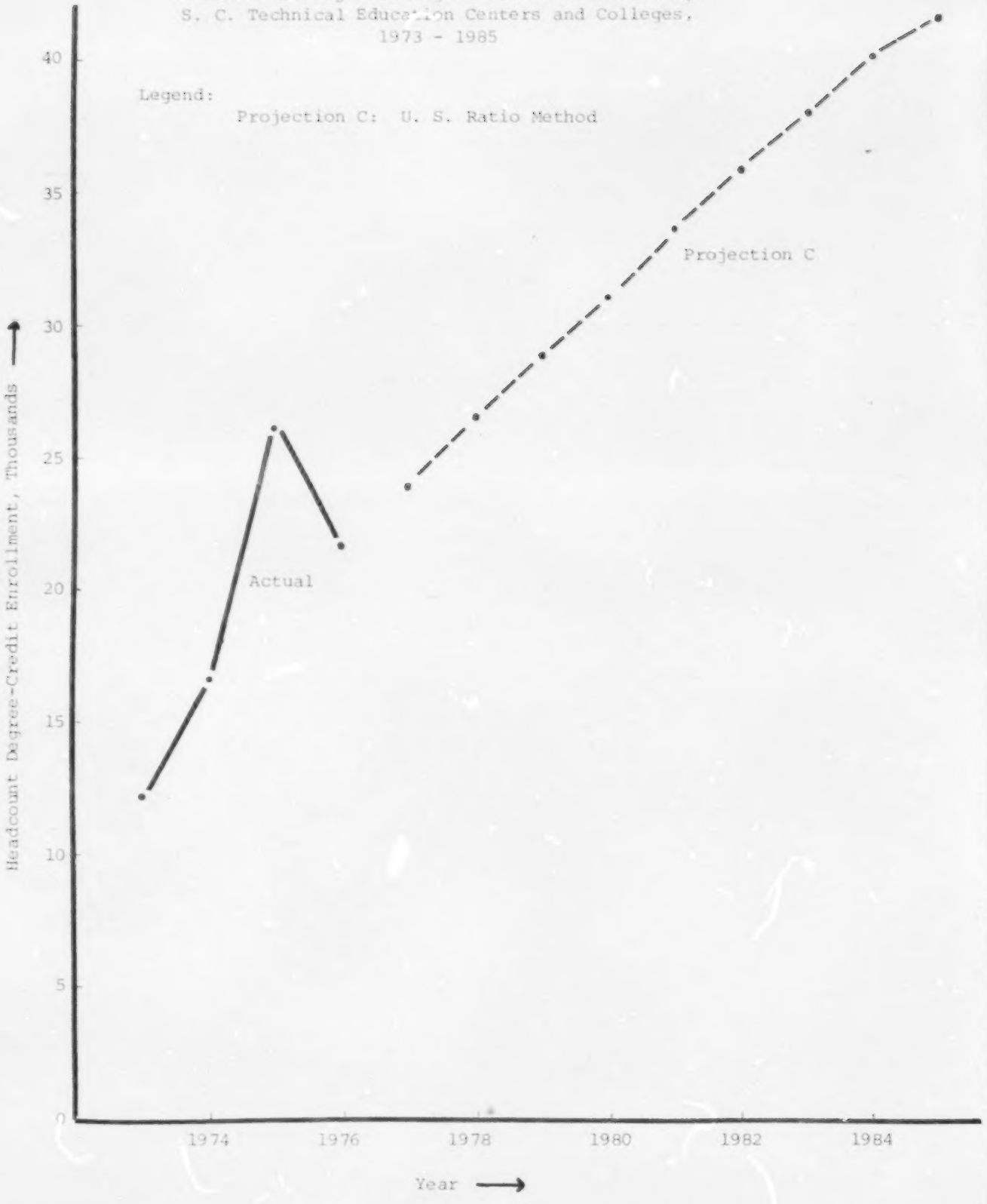
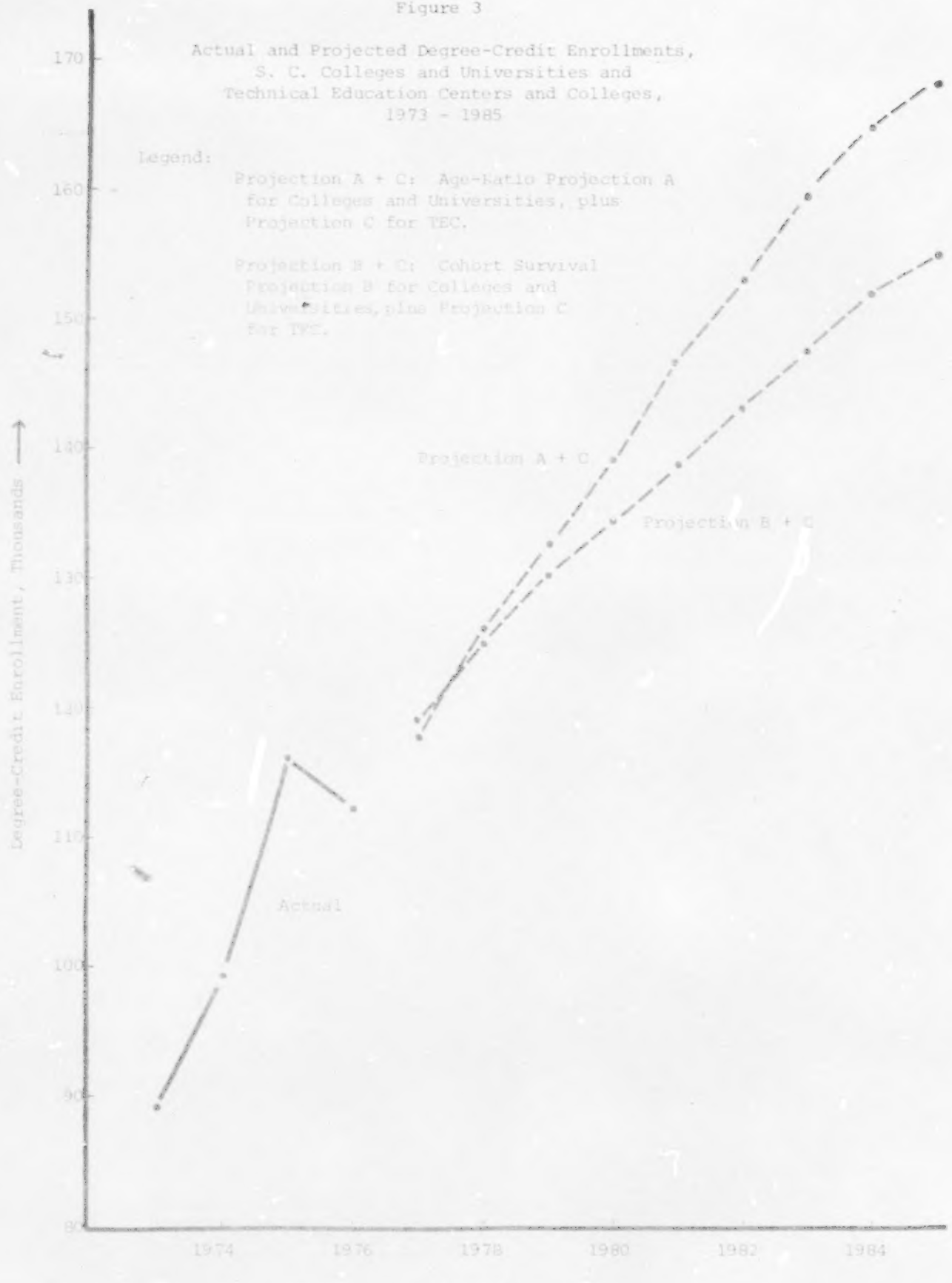


Figure 3

Actual and Projected Degree-Credit Enrollments,
S. C. Colleges and Universities and
Technical Education Centers and Colleges,
1973 - 1985



II. Methodologies Used in Projecting Degree-Credit Enrollment

A. Projections of Enrollments in Public and Private Junior and Senior Colleges and Universities

1. Projection A - The Age Ratio Method

A common procedure for projecting college enrollments is to assume that such enrollments bear a direct relationship to an appropriate segment of the population normally of college age--that is, that portion of the population 18 through 21, or 24, years of age.

An analysis of historical data in South Carolina shows that a simple linear relationship exists between the total headcount enrollment in the colleges and universities (E) and the population in the State 18 through 21 years old (P). The ratio of these two numbers (E/P) is not constant, but changes with time in a way which is historically best described by a linear equation of the form

$$(E/P) = a + bT \qquad (1)$$

where a and b are constants and T is time.

The constants a and b were determined for the period 1962 through 1976 by fitting the observed historical ratios (E/P) in a time-trend analysis using elementary statistical methods. A projection of future ratios (E/P) was made by assuming that the constants a and b will not change in the future. The projected ratios (E/P) were then converted to projected enrollments E by multiplying the projected ratio for a given year by a projected population estimate P for that year.

From this description, it is clear that a key element in this method is the projected future population P of the 18--21 age group in the State. The projected population figures used in this method are given in column 2 of Table I[1]. This projection of the age-group population assumes continuing net in-migration for the next decade at the same rate as was experienced during the period 1970-1974.

Actual (1962-1976) and projected (1976-1985) enrollments as calculated by means of this method are given in column 4 of Table I, and are shown in Figure 1.

A separate analysis was made of enrollments in the public colleges and universities only, using the same technique described above. The results are given in column 5 of Table I, and in Figure 1. The figures in the last column in that Table, showing projected enrollments in the private college sector for the period 1976-1985, were obtained by subtracting projected enrollments in the public sector from the projected totals.

2. Projection B - The Cohort Survival Method

Another popular method of projecting college enrollments depends on the existence of detailed data on the movement of individuals year by year through the educational system, from elementary to secondary schools and to and through college. It is then assumed that the patterns exhibited in the recent past will be maintained in the near future. The method, called the "cohort survival" technique, is attractive in that students expected to be in college in the near future (e.g., through the next decade) are already enrolled in elementary or secondary schools and, therefore, no estimates of future population trends are required to be made. The method has not been widely used in South Carolina because the

TABLE I

Projection A: Age Ratio Method,
Senior and Junior Colleges and Universities

	Year (Sample Years Only)	Population, 18-21 yr. Age Grp.	Ratio, Degree-Credit Enrollment to Age Grp. (%)	Total Degree-Credit Enrollment, All Insts.	Total Degree-Credit Enr. Pub. Insts. Only	Total Degree-Credit Enr. Priv. Insts. Only
Actual						
	1962	175,762	20.4%	35,796	20,040	15,756
	1964	185,081	20.7	38,385	21,496	16,889
	1966	197,741	23.3	46,137	25,668	20,469
	1968	210,577	24.8	52,192	30,149	22,043
	1970	217,738	27.4	59,678	36,493	23,185
	1972	224,863	32.2	72,402	48,228	24,174
	1974	227,885	36.4	82,867	59,532	23,335
	1975	229,400	39.3	90,160	64,898	25,262
	1976	234,800	38.6	90,671	64,657	26,014
Projected						
	1976	234,800	38.2	89,800	63,600	26,200
	1977	236,600	39.7	94,000	67,200	26,800
	1978	241,700	41.2	99,600	71,900	27,500
	1979	243,900	42.7	104,000	75,800	28,200
	1980	245,100	44.1	108,200	79,500	28,700
	1981	248,400	45.6	113,300	83,900	29,400
	1982	249,100	47.1	117,200	87,500	29,700
	1983	250,600	48.5	121,600	91,400	30,200
	1984	249,500	50.0	124,800	94,300	30,500
	1985	246,000	51.5	126,600	96,300	30,300

detailed data necessary to derive retention ratios from grade to grade in the public schools, from the high schools to the colleges, and from class to class in the colleges, have not been available in the past.

In recent years, however, the State Department of Education staff has refined and expanded its data base insofar as public school enrollments and graduations are concerned. Using a cohort survival technique, the Department staff projects periodically the annual number of graduates to be expected from the public high schools, using as a base the recorded births in the State 18 years earlier and subsequent enrollment data.

In addition, the State Department of Education has long collected an annual estimate of the number of these graduates who go immediately on to college as full-time students. This annual estimate, based on a survey of high school principals in the State, enables the Department to estimate the fraction of future high school graduating classes which will move immediately to college as full-time students. Until 1973, however, these figures did not include those students going on to Technical Education Centers and Colleges in degree-credit programs.

The most recent actual (1971-1974) and projected (1975-1981) figures thus available are given in columns two and three of Table II.(2) The projected number of high school graduates immediately entering college, exclusive of the technical institutions, for the years 1982 through 1985 were obtained by extrapolation.

Comparison of the estimates of the number of freshmen provided by the high school principals with actual annual data on college enrollments, provided by the colleges, reveals discrepancies of some magnitude.

TABLE II

Projection B - Cohort Survival Method

	Year	Number Entering College	Fraction H.S. Grads Entering College (%)	Total Undergraduate Degree-Credit Enrollment	Total Degree-Credit Enroll.
Actual					
	1971	12,079	36.18	59,762	65,592
	1972	11,999	34.69	59,431	72,402
	1973	12,810	36.89	64,545	77,049
	1974	13,200	37.63	68,162	82,867
	1975	14,127	38.90	72,364	90,160
Projected					
	1976	14,790	40.52	74,800	91,900
	1977	14,896	40.44	77,300	95,200
	1978	15,348	40.44	80,000	98,700
	1979	15,848	40.37	82,300	101,800
	1980	15,829	40.34	83,600	103,600
	1981	16,210	40.25	85,300	105,900
	1982	16,500		86,800	107,900
	1983	16,790		88,200	109,800
	1984	17,075		89,800	112,000
	1985	17,360		91,400	114,200

Examination of these data for the years 1971 through 1974 indicates that the colleges and universities report an average 60 percent more freshmen than the estimates given by the public high school principals. This discrepancy can be accounted for by the following factors:

1) A substantial number of students do not go directly from high school to college. An example is the student who enters the military or the work force on graduation from high school, but later returns to college.

(2) The figures provided by the public high school principals exclude private secondary school graduates. In the two most recent years for which data are available, the number of graduates from private high schools in the State has averaged 6.5 percent of the number graduating from the public high schools.

(3) There is a net in-migration of out-of-state students as freshmen to South Carolina's public and private colleges combined. Colleges and universities in the State reported a total first-time student enrollment in 1975 of about 17,300, of which 3,980 (23 percent), were not South Carolina residents. In that same year, the State Department's survey of public high school principals indicated that about 2,030 South Carolina high school graduates enrolled in out-of-state institutions.

(4) Some students enrolled in good standing in college remain classified as freshmen as late as the third semester of enrollment, by virtue of not having satisfactorily completed the requisite 30 semester hours' credit, or the equivalent, to be classified as sophomores.

On the assumption that the discrepancy between the current estimates

of the State Department of Education and the actual enrollment data provided by the colleges will remain constant, the projections of the State Department were used to estimate future entering classes that will actually be enrolled in the colleges. Total undergraduate enrollments were calculated from these freshman class estimates by applying, class-by-class, retention ratios derived from an analysis of class sizes reported by a representative sample of South Carolina institutions. (These retention ratios were 0.70 from freshman to sophomore class, 0.84 from sophomore to junior, and 0.92 from junior to senior.) Summing these projected class sizes for a given year yielded a projected figure for each year representing the full-time undergraduate enrollment in colleges and universities in the State, by year.

In order to make this projection comparable to that obtained by the age-ratio method as previously described, the full-time enrollment was converted to headcount (full-time plus part-time students) enrollment, and estimated graduate and professional school enrollments were added.

In the years 1973 through 1975, the average ratio of headcount to full-time undergraduate enrollment in the State was 1.185. This ratio was presumed to remain constant throughout the period of interest. The resulting undergraduate headcount enrollment projection for the years 1976-1985 is given in column 4 of Table II.

Finally, projected graduate and professional school enrollments were estimated. Such enrollments have increased much more rapidly in South Carolina in the past decade than undergraduate enrollments. Projections based on continuation of this rate of growth in graduate

and professional schools to 1985 are believed to be unrealistic. Further, graduate enrollment in South Carolina in 1975 had reached a figure equal to 21.6 percent of undergraduate enrollment, a ratio almost exactly equal to the corresponding figure for the United States as a whole in the same year (21.4 percent).[3] It was, therefore, assumed for the purposes of this projection that in the future graduate enrollment in South Carolina would grow at a slower pace, paralleling that in the United States as a whole, to reach 24 percent of undergraduate enrollment in 1985.[4]

Adding the projected graduate and first professional enrollments to the undergraduate projection described above resulted in the figures shown in column 5 of Table II, and in Figure 1, for the years 1976-1985.

B. Projections of Enrollments in Technical Education Centers and Colleges

1. The Age-Ratio Method

Two factors limit the applicability of methods similar to those described above in projecting degree-credit enrollments in the Technical Education System:

(1) The System was only organized in 1962, and during the intervening years has undergone rapid initial growth which may not be sustained at the same rate in the future; and

(2) Data on degree-credit enrollments in the System were not collected prior to 1970.

An equation of the form of equation (1) was fitted to the available enrollment data, using again the State population cohort of ages 18 through 21 years. Because of the two factors cited above, application of this method resulted in a projection that degree-credit enrollments in Technical Education Centers and Colleges would reach

a total equivalent to 25 percent of the age cohort in 1985.

The staff of the State Board for Technical and Comprehensive Education concurs in the judgement that this continued rate of growth will not be sustained.

2. Projection C - The U. S. Ratio Method

The U. S. Office of Education has estimated(5) that degree-credit enrollments in public two-year colleges will reach a figure equivalent to 17.6 percent of the U. S. population of ages 18-21 years by 1984. It was, therefore, assumed that public two-year colleges in South Carolina, including USC's six two-year regional campuses, would by 1984 not exceed an enrollment equal to 17.6 percent of the State's projected population of college age in that same year.

Using the same projection of the South Carolina population as employed throughout, this would imply a maximum enrollment in 1984 in two-year colleges of 43,900. The maximum estimated for Technical Education Centers and Colleges results if, for this purpose, it is assumed that the current enrollment in USC's two-year regional campuses will not change. That assumption leads to an estimate of 40,400 degree-credit students in the Technical Education System by 1984, equivalent to 16.2 percent of the projected college-age cohort.

A linear interpolation in the ratio of TEC enrollment to population, from the figure of 9.3 percent in 1976 to 16.2 percent in 1984, was applied to arrive at an estimate of TEC enrollments in the future. The assumptions it is necessary to make, and the paucity of historical data, do not warrant a more sophisticated treatment.

The historical data, and projections derived by this method, are shown in Table III, and in Figure 2.

TABLE III

Projection C: U. S. Ratio Method,
Technical Education Centers and Colleges

	Year	Population 18-21 yr. Age Grp.	Ratio, Degree-Credit Enrollment to Age Grp. (%)	Degree-Credit Enrollment, TECs
Actual				
	1970	217,738	1.96%	4,282
	1971	223,352	2.49	5,567
	1972	224,862	3.13	7,033
	1973	226,374	5.41	12,256
	1974	227,885	7.34	16,733
	1975	229,396	11.4	26,248
	1976	234,826	9.30	21,845
Projected				
	1977	236,600	10.2	24,000
	1978	241,700	11.0	26,600
	1979	243,900	11.9	29,000
	1980	245,100	12.7	31,200
	1981	248,400	13.6	33,800
	1982	249,100	14.5	36,000
	1983	250,600	15.3	38,200
	1984	249,500	16.2	40,400
	1985	246,000	17.0	41,900

III. The Combined Projections

Projected total degree-credit enrollment in South Carolina's public and private colleges and universities was obtained by combining the projections A, B and C described above. These projections are shown in Table IV, and in Figure 3.

TABLE IV

Projected Degree-Credit Enrollment in
South Carolina Institutions of Higher Education,
1976-1985

		Colleges & Universities		Tech. Ed. Ctrs. & Colls.	Total	
	Year	Age Ratio Method	Cohort Survival Method	U. S. Ratio Method	Age Ratio Method	Cohort Survival Method
Actual	1976	(90,660)		(21,845)	(112,505)	
	1977	94,000	95,200	24,000	118,000	119,200
	1978	99,500	98,700	26,600	126,200	125,300
	1979	104,000	101,800	29,000	133,000	130,800
	1980	108,200	103,600	31,200	139,400	134,800
	1981	113,300	105,900	33,800	147,100	139,100
	1982	117,200	107,900	36,000	153,200	143,900
	1983	121,600	109,800	38,200	159,800	148,000
	1984	124,800	112,000	40,400	165,200	152,400
	1985	126,600	114,200	41,900	168,500	156,100

Notes

1. The projection of the college-age population in South Carolina was prepared for the Commission on Higher Education by Profs. Elchanan Cohn and Ronald Wilder, members of the faculty of the College of Business Administration, University of South Carolina.

2. South Carolina School Statistics, S. C. Department of Education, Columbia, 1975.

3. Projections of Educational Statistics to 1984-1985, National Center for Educational Statistics, U. S. Office of Education, Department of Health, Education and Welfare, Washington, 1975. Table 13, p.20.

4. Ibid.

5. Ibid., Table 8, p.25 and Table B-2, p.154.

APPENDIX

Technical Notes on the Methodologies

A. The Projected Population in South Carolina Aged 18-21

The projections of enrollment arrived at by the Age-Ratio Method and the U. S. Ratio Method (Projections A and C) depend critically on the projected population of college age. The statistical technique employed results in a projection of the enrollment to the population. Obviously, multiplying a given value of this ratio by differing values of the population results in differing values of projected enrollment.

The projected population of college age (18-21) in South Carolina was calculated from data, and estimates, provided by the U. S. Bureau of the Census.

From the 1970 Census, in which populations were recorded by individual year of age, the population in a given age may be projected forward. For example, the cohort 15 years old in 1970 would be 21 in 1976. Application of this method provides an estimate of what the population in South Carolina aged 18-21 would have been in 1974 provided there had been no net effects of mortality or migration combined.

The U. S. Bureau of the Census provided,[1] in 1975, an estimate of the population of each of the states, by age group, for July 1, 1974. An analysis of the size of the 14-17 age group and of the 18-20 age group as given in that estimate indicated that the younger group was larger, by 4.1 percent, and the older was larger, by 7.1 percent, than was calculated based on the results of the 1970 census. This means that there was, in the period from 1970-1974, a net migration to South Carolina of people in these age groups.

The projected population of the 18-21 years old cohort was calculated under the assumption that the ratio of in-migration, per year of age,

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[1] U. S. Bureau of the Census, Current Population Reports, "Population Estimates and Projections," Series P-25, Number 539. Washington, January, 1975.

evidently experienced in 1970-74, would be continued until 1985.

The resulting projection of the college-age population (Table I) in South Carolina differs substantially from that which would have resulted from a projection forward of the 1970 census alone, as the Table below indicates.

South Carolina Population, 18-21

Year	Projected on Basis of 1970 Census	Projected on Basis of 1974 Census Estimates
1976	226,900	234,800
1978	225,800	241,700
1980	221,200	245,100
1985	202,100	245,900

In the Age-Ratio Method as employed in this study, the enrollment projections are directly related to these population projections. In Projection A, for example, the projection is that the ratio of enrollment to population in 1985 will be

$$E/P = 0.515.$$

Using the lower rather than the higher population estimate for that year would result in an enrollment estimate of

$$E = 104,100$$

rather than 126,600 given in Table I.

The staff of the Southern Regional Education Board has projected enrollments for South Carolina and for the other states in the region.[2] This projection is not identical to the age-cohort method described above because the SREB projections are based on the assumption that the ratios of enrollment to population (E/P) in each of the states

[2]James R. Mingle, Fact Book on Higher Education in the South, 1975 and 1976, Southern Regional Education Board, Atlanta, 1976. Table 12, p.25.

will not follow the different historical patterns established in each state but will instead conform to the overall national pattern in the future. This would mean, for instance, that the ratio E/P for degree-credit (only) enrollment in South Carolina would increase from 0.393 in 1975 to 0.435 in 1985.

What is more important, as noted earlier, the projection of the population cohort utilized by SREB in its enrollment projections differs substantially from the population projection prepared for this report. The SREB projections are based on population projections prepared by the National Planning Association.[3] These projections differ from those made for this report in the estimates of future migration trends. The NCA projection takes cognizance of the fact that in the five-year period from 1970-1975, South Carolina experienced a net in-migration of about 89,000 persons, compared to an average out-migration of about 64,000 persons in each of the two preceding five-year periods. For the forecast period 1975-1980, the NCA projected that total in-migration would decrease to 10,000; and for 1980-1985, the State would again become a net exporter, losing 12,000 persons by this means.

These migration estimates, which represent the major uncertainty in forecasting populations, are made by the NCA on the basis of separate estimates of economic growth and employment opportunities in the several states.

It is worth noting that the NCA population projections used by the SREB have since been revised. The newer estimates by the NCA include a forecast[4] that net in-migration into South Carolina will total 26,000

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[3]J. W. Lee, T. B. Sivia, and D. W. Fay, Regional Projections, States and Large Metropolitan Areas, Report 76-R-1, National Planning Association, Washington, 1976. Section 50, p.273.

[4]T. B. Sivia, National Planning Association, private communication.

in the 1975-1980 period (rather than 10,000), and will remain positive, at 3,000 total for the 1980-1985 period, rather than reverting to a net out-migration of 12,000.

The higher estimates, based on 1974 estimates of the Census Bureau, are used in this study because there is no firm evidence to indicate that South Carolina will not continue to experience net in-migration for the foreseeable future.

B. Projection A, the Age-Ratio Method

Annual figures reflecting total headcount degree-credit enrollment for all South Carolina colleges and universities (excluding only Technical Education Centers and Colleges) were each divided by the appropriate 18-21 age cohort to provide a series of ratios, E/P, for the 15 years 1962 through 1976.

These figures were fitted by least squares to an equation of the form of (1), with the following results:

$$(E/P)_{colls} = 0.1620 + 0.0147\ (y - 1961),$$
$$1962 \leq y \leq 1976.$$

This is the estimating equation for the total college and university enrollments, Projection A. The square of the correlation coefficient, R^2, a measure of the fit of the data to the presumed linear form, was calculated to be 0.925.

An identical procedure was followed using only enrollments in public colleges and universities (and their branches). The results were as follows:

$$(E/P)_{pub} = 0.0698 + 0.0134\ (y - 1961),$$
$$1962 \leq y \leq 1976, \text{ and}$$
$$R^2 = 0.960.$$

C. Age-Ratio Method for Technical Education Centers and Colleges

Degree-credit data for Technical Education Centers and Colleges are not available for years prior to 1970. Applying the same technique as for Projection A for the appropriate data, 1970-1976, yielded this estimating equation:

$$E/P = -0.0043 + 0.0158\ (y - 1969),$$

$$1970 \leq y \leq 1976, \text{ and}$$

$$R^2 = 0.965.$$

The small (and negative) value of the intercept term, compared to the larger time-dependent term, reflects the rapid growth of degree-credit enrollment as reported by these institutions in recent years. Because application of this equation to future years leads to unreasonably large enrollments in the SBTCE system, as explained in the text, the method was not used.